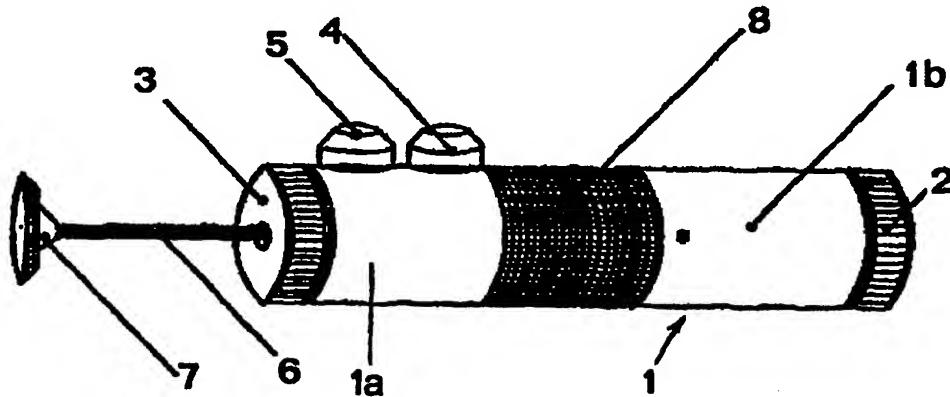




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/EP97/05669</p> <p>(22) International Filing Date: 15 October 1997 (15.10.97)</p> <p>(30) Priority Data: MI96A002179 22 October 1996 (22.10.96) IT</p> <p>(71) Applicant (for all designated States except US): E.T.G. ELETTRONICA DI TERLISIO GIAMPAOLO [IT/IT]; Viale R. Serra, 14, I-20148 Milano (IT).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only): TERLISIO, Giampaolo [IT/IT]; E.T.G. Elettronica di Terlisio Giampaolo, Viale R. Serra, 14, I-20148 Milano (IT).</p> <p>(74) Agent: TRUPIANO, Roberto; Brevetti Europa S.r.l., Piazza Bernini, 6, I-20133 Milano (IT).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>

(54) Title: CALL AND/OR SIGNAL TRANSMITTING AND RECEIVING DEVICE FOR SCUBA DIVERS DURING IMMERSION



## (57) Abstract

Call, alarm or like device for scuba divers during immersions, made up by a substantially cylindrical hollow container (1), sealed at the opposite ends by two stoppers (2, 3) or the like, within which an ultrasound electromagnetic electronic receiving and transmitting circuit (5) is provided, with the relevant sensors for the reception (4) and transmission (5) of electro-acoustic signals, in communication with the outside of the container, as well as for the transformation of the received signals into audio-visible or vibration based warnings, said electronic circuit being fed by a cell or accumulator of a known type, enclosed within said container in such a way as to keep constantly fed the signal reception circuit on immersing and to allow the activation of the transmission circuit through a switch activated by pulling a rope or a fall ending with a knob or the like for hand-activation.

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CALL AND/OR SIGNAL TRANSMITTING AND RECEIVING DEVICE  
FOR SCUBA DIVERS DURING IMMERSION

DESCRIPTION

The present invention relates to an ultrasound two-way transmission device particularly suitable for calls and for alarm and/or danger signals between scuba divers during immersions, by means of electro-acoustic signals.

As is well known to swimmers and in particular to scuba divers during immersions, it is very difficult to draw the attention of the other scuba divers and/or the other underwater companions to transmit them calls or alarm signals, when special dangerous situations happens and, besides, it is necessary to co-ordinate actions, make common directions to be taken, or other reasons; this is due to the freedom movement each scuba diver enjoys, the slowness of movements because of the equipment borne or the pure distraction or distance between the various divers.

At present, call signals between scuba divers are emitted by waving the arms according to movements agreed on or by particular waiving of the instruments or equipment the same scuba divers may held in the hand, or by acoustic, mechanical or hand calls of any type.

Obviously, these types of signals require that the scuba diver(s) to whom the signals are directed be in condition of seeing or hearing directly the diver that gives out the call, which in the practice does not 5 take place always, or even takes place seldom.

Object of this invention is to provide a call or alarm signal designed and structured such as to eliminate the presently used signal systems between scuba divers during immersions, and above all to eliminate the need 10 of a direct view between the divers and to ensure the arrival of the call signal even in case of a great distance between the various scuba divers.

Another object of this invention is to provide a call device applicable also to the hydrostatic equipment of 15 any scuba diver, structured in such a way as to ensure a very reduced overall size and weight, and also such as to be highly reliable up to a very great depth, for instance of 100 metres.

Another object is to provide a device of the 20 aforementioned type so designed as to be easily anchorable and removable from the equipment of the scuba diver, realisable to very reduced cost and easily activable in any underwater conditions.

Another not last object of the invention is to provide coding means to allow a two-way signal transmission only by the concerned divers.

These and still other objects that will become more 5 apparent thanks to the following description, are achieved by a call and signal device for scuba divers during immersions and the like, which is made up, according to the present invention, by a high rigidity container, substantially a cylindrical hollow body, 10 sealed by stoppers or the like, including in the inside an ultrasound electromagnetic electronic two-way transmission circuit with the related sensors for receiving and transmitting electro-acoustic signal, said sensors being in communication with the outside 15 of the container, as well as for the transformation and emission of suitable audio calls, and/or luminous calls and/or vibration based calls on the reception of said electro-acoustic signals, said electronic circuit being fed by a cell or an electric accumulator of a 20 known type within said container, in such a way as to close or self-feed on the contact with water or other conductive element or conductor and such as to keep constantly fed the signal reception circuit and of their transformation and call issuing circuit, and 25 also such as to allow the activation of the

transmission circuit through a switch actionable by pulling a rope or a fall ending with a knob or the like for hand-activation.

More particularly, said calling device is provided, on 5 the external surface of the container, with a length of peelable adhesive tape, known by the "Velcro" trade name, suitable to allow an easy hooking, by banding with more tape, of the container to the conventional buoyancy equilibrator of a conventional apparatus for 10 scuba divers during immersions.

Besides, between said accumulator and said electronic two-way transmission circuit a code selector is located, suitable to ensure that the electro-acoustic signals issued and received are reserved only for the 15 divers that utilise the coded device.

According to the present invention, the call device may be advantageously associated, also as an integrated part, with the mask of the diver, with the inside of a flash-light or with the inside of the 20 decompression computer, or with the inside of the knife handle, or other suitable apparatuses that form the conventional equipment of divers.

Further characteristics and advantages of this invention will be stressed by the following detailed 25 description made with reference to the only attached

figure, showing a view of a preferred non limiting embodiment of the device subject matter of the invention

With reference to said only figure, the device is  
5 substantially made up by a container having a tubular shape 1 from plastic material or metal, resistant to the pressure exercised by water at a depth of at least 100 metres.

Said tubular body 1 can be sealed by two end stoppers  
10 2 and 3, so as to form a water-tight sealed container.

In length 1a of container 1 an electronic circuit is included comprising an electromagnetic ultrasonic digitalised coded two-way transmission device of a known type (not shown) such as for instance the one  
15 subject matter of the patent application no. MI95A 001072 in the name of the same applicant, activated through a circuit similar to the one utilised for the activation of a quick exhaust valve of the buoyancy equilibrator associated to the equipment of scuba  
20 divers during immersions.

In length 1b of the same tubular body 1 there is housed a cell or an accumulator, for instance of the alkaline tubular low voltage - substantially a 9 volt - type, which is kept constantly in contact with the

entries of said two-way transmission circuit by closing said stopper 2.

The sensor of the receiving stage 4 and the sensor of the transmitting stage 5 are located in contact with 5 water (either sea- lake- or river water), so as to allow the transmission and reception of ultrasound signals by exploiting water conductivity.

The received signals are transformed into luminous calls, audio-calls or vibration based calls having an 10 intensity sufficient to be easily heard by the diver provided with the calling device, also at a long distance from the emitting apparatus.

In stopper 3 a magnetic switch is associated to the transmission circuit 5, which can be activated from 15 the outside of the tubular body by pulling a rope 6, either rigid or flexible, passing through the stopper and ending by a grasp-knob 7 or the like.

Besides, in order to allow the exchange of signals at a distance only between two or more divers, in housing 20 1b of the tubular body 1 an impulse selector (not shown) is provided, for the coding of said signals.

Lastly, on the external surface of tubular body 1, there is stably wound, according to a preferred embodiment, at least a length of an adhesive indented 25 tape 8 known by the "Velcro" trade name, which allows

to hook the calling device to the conventional buoyancy equilibrator of diver equipment, also provided with lengths of Velcro tape.

Obviously, instead of Velcro tapes for quickly hooking  
5 and unhooking the calling device of the equilibrator, hooks or other anchoring means may be provided that can perform the same function.

In practice, the above described device remains activated throughout the immersion time and, more  
10 particularly, there remains activated uninterruptedly only the receiving circuit that receives the signal and provides to the emission of an acoustic signal and/or luminous signal or even of a vibration based signal which is perceived by the diver, while the  
15 transmitting circuit is activated by the diver only if the situation should so require.

Actually, if two or more divers, all of them provided with the same calling device, are underwater at the same time, one (or more than one) of them closes the  
20 transmission circuit by pulling the knob 7 of his device, sending in this way an electro-acoustic signal to the other divers who, on receiving the call on their device, can pay attention or go towards the other ones, or towards the diver who has called, if  
25 only two divers are underwater.

In practice, the above described device may be utilised to perform manoeuvres or other tasks if the divers, before the immersion, have agreed on performing some manoeuvres according to a special 5 code, such as for instance the following one: the transmission of one only signal means that a given manoeuvre should be performed by all divers; the transmission of two signals means that another type of previously agreed manoeuvre should be performed, and 10 so on.

In these cases, all the manoeuvres agreed on can be carried out with no need for divers to look at each other or to approach to each other.

To sum up, the above description made with reference 15 to the attached figure stresses the great practical importance of the present invention, which allows to solve in a simple, quick manner and in safe conditions, any problem of co-ordination between scuba divers during immersions.

20 It is lastly obvious that many variants and modifications, equivalent from the structural and functional point of view, may be introduced in the invention as described according to a preferred embodiment, which variants and modifications fall 25 within the protection scope of the invention.

## CLAIMS

1. A call, alarm and/or signal transmission electronic device for scuba divers during immersions and the like, characterised in that it is made up by a  
5 container, substantially a hollow cylindrical body (1), water-tight sealed, comprising in the inside an ultrasound electromagnetic electronic two-way transmission circuit with the related sensors (4, 5) for the reception and transmission of the electro-  
10 acoustic signals, said sensors being in communication with the outside of the container, as well as for the transformation and emission of suitable audio signals and/or luminous signals and/or vibration based signals on receiving said electro-acoustic signals, said  
15 electronic circuit being fed by a cell or an accumulator of a known type, included in said container (1), in such a way as to close or self-feed on the contact with water or other conductive element or conductor, and as to keep constantly fed the  
20 circuit (4) that receives the signals and transforms or emits them, and also such as to allow the activation of the transmission circuit (5) through a switch activated by pulling a rope or a fall (6) ending by a knob (7) or the like for hand-activation.

2. The electronic device according to claim 1, characterised in that a coding selector is located between said electronic circuit and said electric accumulator, suitable to ensure that the signals emitted or received are used only by the divers who are provided with said calling device.
3. The electronic device according to claim 1, characterised in that the calling device is advantageously associated, also as an integrating part, with the mask of the diver, or with the inside of a flash-light, or with the inside of the decompression computer, or with the knife handle or any other apparatus that make parts of the conventional equipment of all scuba divers.
4. The electronic device according to claim 1, characterised in that to the container 1 a length of adhesive tape (8) is anchored, of the type peelable and re-attachable several times, which is the means for quickly hooking and unhooking the device to the buoyancy equilibrator that makes part of the equipment of scuba divers.
5. The electronic device according to claim 1, characterised in that it is fed by a low voltage - substantially 9 volt - accumulator or electric cell.

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6. The electronic calling device according to the preceding claims, characterised in that it is realised for the purposes and tasks as above specified, according to what has been described and illustrated.

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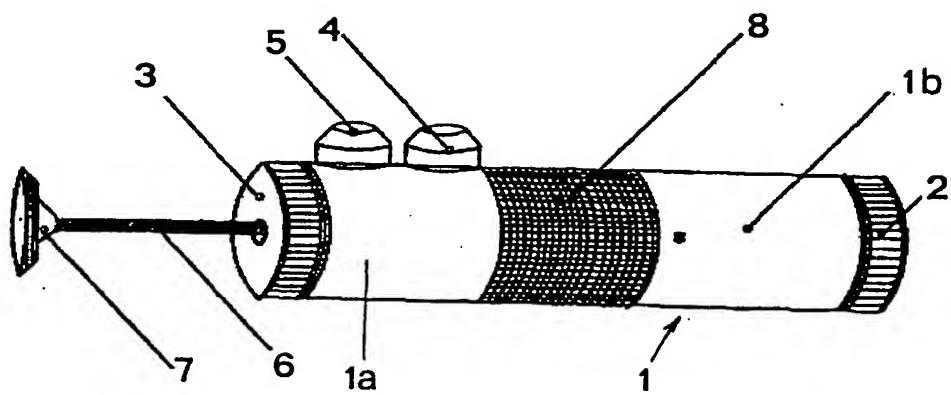


fig.1

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 97/05669

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 B63C11/26 H04B11/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 B63C H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 523 982 A (DALE) 4 June 1996 see the whole document	1-6
Y	GB 2 108 666 A (BARNES MANAGEMENT AND DEVELOPMENT SERVICES LTD) 18 May 1983 see page 1, line 100 - line 123; figure 1	1-6
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Date of the actual completion of the international search

11 February 1998

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According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 B63C H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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